Westinghouse

Westinghouse Electric Company
Nuclear Services
P.O. Box 355
Pittsburgh, Pennsylvania 15230-0355
USA

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington DC 20555

Direct tel:
Direct fax:
e-mail:

Your ref:
Our ref: LTR-NRC-05-25

April 12, 2005

Subject: Closure of Westinghouse Interim Report No. 04-006.

Reference: 1. LTR-NRC-05-5, "Interim Report of an Evaluation of a Deviation or Failure to Comply Pursuant to 10CFR21.21(a)(2)", dated .February 1, 2005.

On February 1, 2005 Westinghouse submitted an Interim Report (Reference 1), pursuant to the requirements of 10CFR Part 21, regarding an evaluation of reportability which could not be completed within 60 days from the discovery of the deviation or failure to comply. The issue being evaluated by Westinghouse concerns Centrifugal Charging Pump Runout During Safety Injection and was designated Interim Report No. 04-006.

The purpose of this letter is to close Interim Report No. 04-006.

If you have any questions regarding this matter, please contact me at (412)374-4643.

Regards,

James A. Gresham, Manager
Regulatory Compliance and Plant Licensing.

Attachment

IE20

Westinghouse Electric Company
P.O. Box 355
Pittsburgh, PA 15230-0355

Interim Report No. 04-006 (Closeout)

SUBJECT:

Closure of Interim Report 04-006 regarding an evaluation of a Deviation or Failure to Comply Pursuant to 10CFR21.21(a)(2)

TITLE:

Centrifugal Charging Pump Runout During Safety Injection

BASIC COMPONENT SUPPLIED BY:

Westinghouse Electric Company

NATURE OF DEVIATION:

For 3-loop and 4-loop Westinghouse NSSS plant designs that use centrifugal charging pumps (CCP) for post-LOCA high head injection, the following specific combination of initiating events and conditions may lead to CCP flow rates beyond the pump vendor-approved values:

- Double Ended Guillotine Break (DEGB) LOCA with consequential predicted RCS depressurization.
- Loss-of-Offsite Power (LOOP) coincidental with the DEGB LOCA
- Failure of a Full Train of Safety Injection (SI). *
- Repositioning of the charging flow control valve to the full open position

Westinghouse has conservatively estimated the probability of these conditions existing simultaneously to be between 5.0E-10 and 2.0E-12 per year. Under these conditions and during realignment from a normal charging configuration to a safety injection configuration, when the charging pump discharge isolation valves stroke closed and the SI isolation valves stroke open in parallel, coincident with CCP start, the CCP flowrate may exceed the pump vendor-approved runout flow. The runout condition would exist for 3 seconds (4-loop) and 7 seconds (3-loop). The actual flow rate during the stroking period is not important to system performance. The concern is the pump's availability and capability following the flow transient to perform long term consistent with design and analysis assumptions.

* Failure of one of the CCPs may also cause the second pump to runout. However, unlike loss of a CCP from failure of a full train, safety injection flows will exceed design basis values for a single CCP failure.

DATE OF DISCOVERY OF DEVIATION:

December 1, 2004

EVALUATION STATUS:

The extent of the beyond-runout condition has been evaluated for representative 3-loop and 4-loop Westinghouse NSSS plants that use centrifugal charging pumps for safety injection. Although

operation beyond runout was not approved by the pump vendor when contacted, a review of information available in the open literature has enabled the judgment to be made that although some mechanical damage cannot be precluded, such damage is expected to be limited to increased wear on the pump wear rings. The increased wear from this once-in-a-plant-lifetime event is judged to remain within the range resulting from normal contact experienced during CCP starts and stops considered by the original design. Some degraded performance due to cavitation, limited to the low pressure stages of the pump, is expected during the runout condition. However, the pump is expected to recover to normal operating conditions when the system transient is completed, and to be able to perform its design function for the required period needed for post-LOCA recovery.

The Westinghouse evaluation also postulated the scenario of the CCP not being available post LOCA. In this scenario, the post-LOCA short term contribution of the CCP is relatively small compared to the flow provided by the remaining SI subsystems and could be partially or completely offset by crediting margin between the conservative assumptions used to calculate licensing-basis SI system flows and the actual system performance capability. The impact for long-term cooling is primarily on recirculation alignments that are necessary to preclude boric acid precipitation in the core. Examination of Westinghouse chemical and volume control system (CVCS)/SI designs confirms alignment capability. For plants that rely solely on Charging/SI pumps to provide flow to the hot legs during hot leg recirculation, it is judged that operators could take action to align some or all of the RHR pump flow to the hot legs. For plants that rely solely on the Charging/SI pumps to provide simultaneous flow to the cold legs during hot leg recirculation, the need for cycling RHR and/or SI pump flow back to the cold legs could be evaluated by plant engineering staff at the time of the incident.

Based on the above evaluation results, it has been determined that this issue does not represent a substantial safety hazard pursuant to the requirements delineated in 10CFR Part 21.